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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

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LOUIE, W

ART UNIT

PAPER NUMBER

2814

#5

DATE MAILED:

08/01/01

PI as find below and/or attached an Office communication concerning this application or
pr c eding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/476,558	HU, YONGJUN	
	Examiner	Art Unit	
	Wai-Sing Louie	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 1-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- | | |
|--|---|
| 15) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 18) <input checked="" type="checkbox"/> Interview Summary (PTO-413) Paper No(s). <u>3</u> . |
| 16) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 17) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. | 20) <input type="checkbox"/> Other: |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-15, drawn to a coating material, classified in class 118, subclass 504.
 - II. Claims 16-40, drawn to a semiconductor structure, classified in class 257, subclass 437.

Inventions Group I and Group II are related as combination and subcombination.

Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the antireflective compound could be used as a dielectric stack. The subcombination has separate utility for use with an optical device.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Greg Taylor on 7/12/01 a provisional election was made with traverse to prosecute the invention of Group II, claims 16-40. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-15 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Drawings

3. The drawings are objected to because figures 5 and 6 referenced in specification page 17 are missing from the present application. Correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 16 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Brady et al. (US 5,066,615).

With regard to claim 16, Brady et al. disclose a semiconductor structure (col. 2, line 39 to col. 6, line 65 and fig. 1) comprising:

- A semiconductor substrate 11;
- An ARC 21 over the semiconductor substrate comprises a metal silicon nitride, and the metal is selected from the group consisting of Ti, Zr, Mo, Ta, and W (col. 3, lines 23-27).

With regard to claim 18, Brady et al. disclose the ARC has a thickness of 300 Å (col. 4, line 48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17, 19, 26, and 32-36 (in so far as they are understood) are rejected under 35 U.S.C. 103(a) as being unpatentable over Brady et al. (US 5,066,615) in view of Fan et al. (US 5,116,427).

With regard to claims 17 and 19, Brady et al. do not disclose the metal silicon nitride ternary compound is selected from the group consisting of titanium tungsten nitride. However, Fan et al. disclose the refractory metal, titanium tungsten nitride have suitable antireflective characteristic (Fan col. 2, lines 34-35 and lines 63-67). Fan et al. teaches the refractory metal can operate at very high temperature and it can be utilize as a barrier to prevent diffusion of metal to other semiconductor layers (Fan col. 2, lines 60-63). Hence, it would have been obvious to one with ordinary skill in the art to provide TiWN in Brady's device in order to boost the operation temperature and as an anti-diffusion layer.

With regard to claims 26 and 32, Brady et al. modified by Fan et al. disclose a semiconductor structure comprising:

- A semiconductor substrate 11;
- An ARC upon the semiconductor substrate, the ARC composing a metal silicon nitride $M_xSi_yN_z$ (see rejection in claim 21 above), where:
 - X is greater than zero (col. 3, line 62);

- Y could be greater than x;
- Z is greater than zero and less than 5y (see above formula);
- M is at least two transition metal composed of $M_1M_{2(1-r)}$ (see claim 17 above);
- R could be in a range 0 to 1;
- M1 and M2 are Ti and W (Fan col. 2, line 65);
- M1 is not M2 (Fan col. 2, line 65).

With regard to claim 33, in addition to structure disclosed in claim 26 above, Brady et al. also disclose:

- Metal silicide binary compound is $M_1M_{2(1-r)}Si_s$ (Fan col. 2, line 67);
- M1 and M2 are selected from the group listed above.

With regard to claims 34 and 35, Brady et al. disclose M1 and M2 are selected from the group consisting of Ti, Ta, and W (Fan col. 2, lines 63-67).

With regard to claim 36, Brady et al. disclose the metal silicide binary compound is M_1xSi_y and M is tungsten, where x could be 1 and y could be 1.5 to 5 (col. 2, line 10).

6. Claims 20-25, 27-31, and 37-40 (in so far as they are understood) are rejected under 35 U.S.C. 103(a) as being unpatentable over Brady et al. (US 5,066,615) in view of Niroomand et al. (US 5,886,391).

With regard to claims 20, 23, 28, 31, and 37-38, Brady et al. disclose the ARC layer has a thickness of 300 Å (col. 4, line 48) and is amorphous silicon (col. 5, line 53). Brady et al. do not disclose the ARC is composed of hemispherical grained polysilicon. However, Niroomand et al.

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disclose the polysilicon layer is a rough or hemispherical grained layer (Niroomand col. 9, line 25). Niroomand et al. teach the rough grained layer scatter the unabsorbed light (Niroomand col. 9, lines 15-20). Hence, it would have been obvious to one with ordinary skill in the art to provide a hemispherical grained polysilicon layer in order to provide an antireflection layer to scatter the unabsorbed light.

With regard to claims 21 and 22, Brady et al. disclose the metal silicon nitride used in the invention expressing as x-silicon-nitride (col. 6, line 12). One with ordinary skill in the art would have known silicon nitride is Si_3N_4 . Therefore, it is obvious that the formula could be expressed as $\text{M}_x(\text{Si}_3\text{N}_4)$.

With regard to claims 24 and 39, Brady et al. disclose the relative reflectivity of various compounds comparing to aluminum over a significant wavelength range in fig. 6. the relative reflectivity in 380 nm wavelength is in about 15-20% (col. 4, lines 32-50 and fig. 6).

With regard to claims 25 and 40, Brady et al. disclose the ARC is used in photolithographic process (col. 1, lines 14-15). One with ordinary skill in the art would have known that ARC applies to the photolithographic process for masking and etching opening, groove, trench and other features on a semiconductor substrate. Hence, it is obvious the trench, well and other features on a substrate are included.

With regard to claims 27 and 30, Brady et al. disclose the ARC has a thickness of 300 Å (col. 4, line 48).

With regard to claim 29, in addition to structure disclosed in claim 26 above, Brady et al. also disclose:

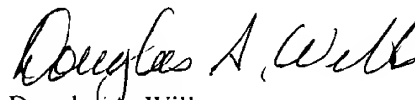
- An electrically insulative layer 12 on a semiconductor substrate (fig. 1);

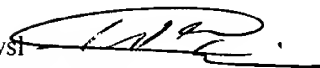
- A patterned electrically conductive metal line 13 on the elective insulative layer (fig. 1).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


Douglas A. Wille
Patent Examiner


WSL
July 26, 2001